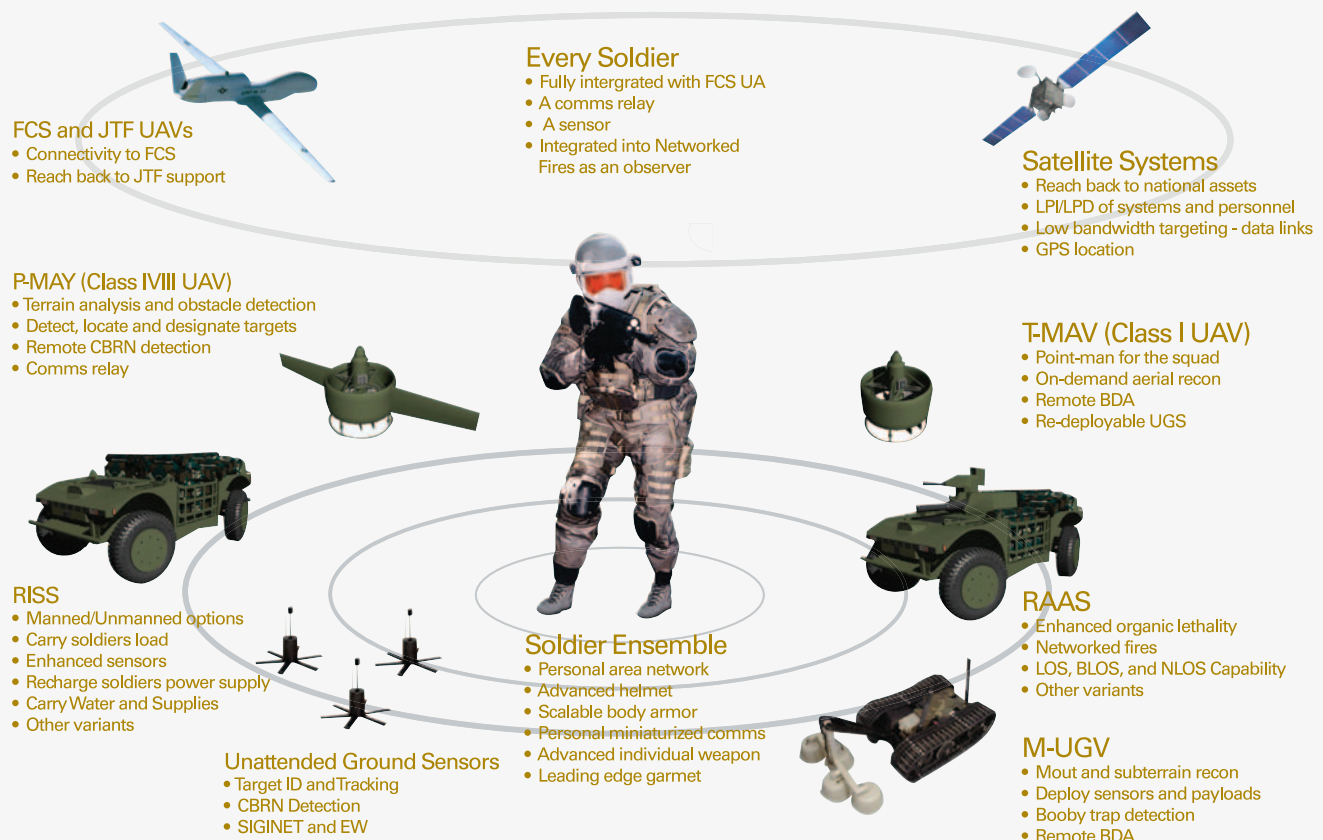# The Role of the OFW LTI:
The Eagle Enterprise Perspective

Kevin G. Bonner and Scott D. Myers

Unmanned ground and air platforms perfom manpower-intensive or high-risk tasks – reducing the soldier's exposure to risk, while expanding his area of operations and influence.

FCS and JTF UAVs
- Connectivity to FCS
- Reach back to JTF support

Every Soldier
- Fully intergrated with FCS UA
- A comms relay
- A sensor
- Integrated into Networked Fires as an observer

Satellite Systems
- Reach back to national assets
- LPI/LPD of systems and personnel
- Low bandwidth targeting - data links
- GPS location

P-MAV (Class IVIII UAV)
- Terrain analysis and obstacle detection
- Detect, locate and designate targets
- Remote CBRN detection
- Comms relay

T-MAV (Class I UAV)
- Point-man for the squad
- On-demand aerial recon
- Remote BDA
- Re-deployable UGS

RISS
- Manned/Unmanned options
- Carry soldiers load
- Enhanced sensors
- Recharge soldiers power supply
- Carry Water and Supplies
- Other variants

Soldier Ensemble
- Personal area network
- Advanced helmet
- Scalable body armor
- Personal miniaturized comms
- Advanced individual weapon
- Leading edge garmet

RAAS
- Enhanced organic lethality
- Networked fires
- LOS, BLOS, and NLOS Capability
- Other variants

Unattended Ground Sensors
- Target ID and Tracking
- CBRN Detection
- SIGINET and EW

M-UGV
- Mout and subterrain recon
- Deploy sensors and payloads
- Booby trap detection
- Remote BDA

As the Lead Technology Integrator (LTI) for the Natick Soldier Center (NSC)-led Objective Force Warrior (OFW) Phase II program, Eagle Enterprise (a General Dynamics Co.) works with NSC to select and integrate leap-ahead technologies to create the equipment and operational concepts for the Army's future soldier. The OFW soldier must be capable of revolutionary lethality, survivability and mobility and be fully integrated and interoperable with the Army's other major transformation efforts under Future Combat Systems (FCS).

To achieve a lightweight, overwhelmingly lethal, fully integrated individual soldier combat system, Eagle Enterprise is implementing an approach that focuses on:

- Soldier Borne Systems (SBS) that include everything worn, borne or consumed by the dismounted soldier.
- Integrated systems-of-systems approach focusing on a

soldier-centric force enabled by robust, netted communications, advanced situation awareness and netted direct and indirect fire effects.

To achieve the OFW soldier system-of-systems vision, Eagle Enterprise has formed a diverse, 16-member team of technology and systems integration experts to provide a comprehensive evaluation of suitable technologies to be incorporated into the OFW Phase II system prototypes and a rigorous system-of-systems engineering approach to ensure technologically feasible and field-supportable OFW systems that can transition to Program Executive Office (PEO) Soldier. The Eagle Enterprise team's ability to employ new technologies and operational concepts is facilitated by the agreement between Eagle and its government customer. The Section 845 agreement establishes a true partnership between Eagle and the government and allows for changes in team membership to incorporate new technology providers as well as coordinate seamless transition to Phase III when all milestones are met (approximately mid-FY05).

Technology Assessment/ Selection

During the competitive Phase I, Eagle Enterprise identified enabling technologies to drive leap-ahead capabilities in OFW units and developed concepts for all soldiers in the unit of action. These capabilities include:

- Integrated soldier-level protection and individual equipment system.
- On-the-soldier power generation and management.
- Networked communications with multilevel security.
- Semiautonomous ground mobility support for soldier offload and resupply.
- Networked effects for massed fires.
- Multispectral enhanced vision.

- Integration of an individual soldier weapon into system functionality.
- Information management software for situational awareness and tactical planning and modification.

Comprehensive technology surveys and assessments were initiated to identify candidate technologies in each technical domain enumerated above. In all, 2,073 specific DOD- or government-sponsored and commercial technologies were identified and entered into their respective trade spaces. Each technology was assessed using both quantitative and qualitative methodologies for OFW applicability on the basis of power usage, technology readiness level, weight, cost, form factor and technology-specific discriminators.

The 884 technologies deemed appropriate for OFW use were then assigned an overall score of 1 (poor) to 5 (excellent) for suitability insertion during Phase II. In each category, primary and alternate technologies were selected to define the overall OFW system concept. The initial choices for SBS components are being reevaluated during Phase II for insertion into the system during the spiral development process described below.

System-of-Systems Approach

Unlike most science and technology (S&T) programs, to ensure appropriate risk reduction during the S&T phase prior to transitioning to the PEO OFW has adapted a formal systems engineering process, including compliance with Software Engineering Institute/Capability Maturity Model levels, which provides software development monitoring processes and metrics to ensure ease of integration within the SBS, across the Small Team Systems and to achieve interoperability with FCS.

Eagle has made systems engineering an integral part of its integrated product and process development by creating the Systems Engineering Team (SET). SET operates in conjunction with the User and Operational Effectiveness Team (UOET) and the System-of-Systems Integration Team (SoSIT) to develop the OFW prototypes, move requirements forward and ensure user acceptance. Each major team and its subteams are co-led by government and LTI members. SET is charged with overseeing the overall spiral development of small soldier team requirements through sound analyses, technology exploration, experimentation and assessment with users in a relevant operational environment. SET focuses on requirements tracking, developing and managing a sound modeling and simulation methodology, providing analysis and assessment capabilities and applying systemic influence for human/ system interaction (MANPRINT), interoperability, producibility, logistics and training. One of SET's goals is to support achievement of an approved operational requirements document to support a Milestone B decision.

SET flows its requirements to the SoSIT that is responsible for the development of integrated OFW prototypes through a spiral development process. The program's spiral development approach, selected by Eagle

> SBSIT manages development of and integrates human-worn and human-borne equipment, providing requisite resources to the development of integrated protection and individual equipment, electronics, radio equipment, energy storage, weapon systems and physiological monitoring and sustainment.

because of the aggressive OFW schedule, is a robust, iterative process enabling incremental capability growth. To mitigate schedule risk, in addition to the spiral development process, the Eagle approach relies heavily on modeling and simulation to prove the maturity of technology, integration and operational concepts. A critical element in SoSIT's charter is the development of architecture that is flexible enough to accommodate future OFW developments and be compatible with FCS. Three integration subteams under the SoSIT are managing the development and integration of key aspects of the SoS architecture: SBS Integration Team (SBSIT), Software Integration Team (SIT) and Small Team Systems Integration Team (STSIT).

SBSIT manages development of and integrates human-worn and human-borne equipment, providing requisite resources to the development of integrated protection and individual equipment, electronics, radio equipment, energy storage, weapon systems and physiological monitoring and sustainment. SIT provides the netted communications and collaborative situational awareness that enables the OFW's revolutionary capability. STSIT leverages the assets available to the dismounted soldier as an integral part of the teams, squads and platoons, developing and assisting in testing and assessment of capabilities provided by integrating unmanned ground and air vehicles and sensor fields with the soldier.

UOET provides the continuous user voice throughout the spiral design process to facilitate synchronizing the OFW technologies with user expectations. This team provides SoSIT with continuous feedback while SoSIT and SET provide feedback to the user community for continued refinement of the OFW operational concepts and Land Warrior Block III requirements.

In summary, OFW is a pioneering program, bringing the engineering discipline normally associated with system development and demonstration programs earlier in the acquisition life cycle while retaining the traditional innovative S&T development and prudent risk-taking environment. LTI's role is to develop OFW SBS prototypes capable of fighting effectively in small units and with FCS and future joint forces, while also ensuring that OFW products can be transitioned successfully into the Land Warrior acquisition program.

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